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ENVIRONMENTAL MANAGEMENT, INC.

KHM

January 17, 2003
Project B30-01J

Mr. Don Pettit, R.G.
Oregon Department of Environmental Quality-NW Region
2020 SW 4th, Suite 400
Portland, Oregon 97201

RE: Work Plan for
IRAM Pilot Test and IRAM Area Delineation Activities
for the KMLT Linnton Terminal
Portland, Oregon

Dear Mr. Pettit:

On behalf of Kinder Morgan Liquid Terminals, LLC (KMLT), KHM Environmental Management, Inc. (KHM) has prepared this letter to present a work plan for further delineation of the Initial Remedial Action Measures (IRAM) Area, and IRAM pilot testing to be completed by TRC under the direction of KHM at the above-referenced site. The goals of these activities are to further assess the IRAM area and assess options for the recovery of separate phase hydrocarbons (SPH).

Oregon Department of Environmental Quality (DEQ) issued a letter dated January 13, 2003 regarding the review of the Draft Remedial Investigation (RI) for the subject site. KMLT and KHM appreciate the quick response in the review of the Draft RI document and are reviewing the DEQ's comments at this time. We intend to address further delineation of the IRAM area and initial IRAM pilot testing as presented in the work plan. Addressing the comments to the Draft RI will be completed once we have further reviewed DEQ's comments and had the opportunity to meet in the upcoming weeks.

SCOPE OF WORK

The scope of work to achieve the above-stated goals consists of three tasks: 1) investigation of the IRAM area extent; 2) IRAM pilot testing; and 3) report preparation.

TASK 1 – INVESTIGATION OF IRAM AREA EXTENT

KHM is proposing the installation of three 4-inch diameter wells in the locations shown on the attached Figure 2. These locations have been chosen to further define the area of the site where the implementation of IRAM activities is appropriate.

These wells will be installed using a drill rig equipped with hollow-stem augers. Based upon previous well installation activities, the wells will be completed to an approximate depth of 35 feet below grade. The well design will be based upon field conditions encountered during drilling and past groundwater elevation data. Groundwater exists beneath the site at depths ranging from approximately 20 to 24 feet below grade. It is expected that the new wells will be completed to a depth of approximately 35 feet below grade. The screen interval will consist of 20 feet of machine-slotted casing and will span the water table elevation with approximately 10 feet of screen above the potentiometric surface and 10 feet below. After the wells have been constructed, KHM will subcontract Chase Jones, of Portland, Oregon to survey the wellhead elevations to the City of Portland Datum.

During the boring activities for the well installation, soil samples will be collected for potential laboratory analysis and logging purposes every five feet using a split-spoon sampler. Soil samples will be collected from the soil core in the split-spoon sampler manually into glass sample jars supplied by the laboratory. The samples will be immediately labeled with a sample identification number, project name and number, and date of collection. After sample collection, the remaining soil will be field screened using a photoionization detector (PID). The PID readings will be recorded on the boring log. Logging will be performed for the soil encountered in each of the borings, beginning at the surface and continuing to total depth for visual observation and classification. The soil encountered during drilling will be logged following the ASTM-D2488 titled *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*.

A minimum of three soil samples from each boring will be submitted to the laboratory for analysis. The samples will be analyzed for total petroleum hydrocarbons (TPH) as gasoline by Northwest (NW) Method TPH-Gx, TPH as diesel and oil by NW Method TPH-Dx, polynuclear aromatic hydrocarbons (PAHs) by USEPA Method 8270M-SIM, and benzene, toluene, ethyl benzene, and xylenes (BTEX) by USEPA Method 8021B.

TASK 2 – IRAM PILOT TESTING

Description of the Proposed Short-Term Pilot Test

Pilot Test Approach

The proposed pilot testing will consist of two phases of site work. The goal of the first phase (Phase 1) of the pilot test is intended to provide immediate removal of SPH and assess the general effectiveness of SPH recovery by comparing volume of SPH removed to the volume of groundwater extracted. The second phase (Phase 2) of pilot testing is intended to further assess the effectiveness of SPH removal using vacuum extraction or bioslurping technology. Assessment of the effectiveness of Phase 2 of pilot testing will be primarily based on the SPH recovery with minimal groundwater extraction.

Phase 1- Pilot Testing Setup and Monitoring

Phase 1 of the proposed pilot testing is anticipated to be conducted over a period of three days, and will be completed by TRC Alton Geoscience (TRC) (http://www.trcmts.com/1st.htm) of Concord, California. Phase 1 of the testing will utilize TRC's truck-mounted liquid ring pump and support equipment. Additional details on TRC's truck mounted equipment are provided below, under the Phase 2 testing description. The proposed Phase 1 extraction will be conducted from wells with measurable SPH in the IRAM area. Based on the SPH thickness measurements completed on December 30, 2002, the proposed extraction wells for Phase 1 pilot testing will likely consist of RW-1, RW-2, RW-3, RW-5, MW-10, and MW-11. SPH thickness measurements will be collected from the above wells prior to initiating Phase 1 pilot testing activities.

Approximately one week prior to the start of Phase 1 pilot testing, four pressure transducers with data logging capabilities will be installed into Wells MW-3, MW-9, MW-13, RW-4 for monitoring of the groundwater levels in these wells. The pressure transducers will be utilized for a period of approximately one month, allowing for groundwater elevation monitoring prior, during, and following the pilot testing. Use of the pressure transducers with data logging capabilities will also allow for the monitoring of groundwater elevations in the wells for comparison to the river stage, specifically, monitoring potential changes in the groundwater elevation associated with river stage changes. Initial monitoring will be completed prior to the start of extraction and will consist of depth to water (DTW) and Depth to Product (DTP) measurements in the wells within and near the IRAM area, specifically, MW-1, MW-2, MW-3, MW-10, MW-11, P-5, and RW-1 through RW-5 (Figure 1). Wells MW-9, MW-16, MW-13, and P-3 will also be gauged to provide "background" DTW and DTP readings, providing a general assessment of changes in the groundwater surface between the start and end of the Phase 1 pilot testing.

For Phase 1 pilot testing, a drop-tube will be installed at or above the groundwater – SPH interface. From the December 30, 2002 SPH measurements, the drop-tube installation depth is anticipated to range from 15 feet to 19 feet below the ground surface. The well-head will be sealed around the drop-tube during the extraction. Extraction will be completed at each well within the IRAM area, with measurable SPH; and, when possible, two or more of the wells will be used for extraction at one time.

During the Phase 1 pilot testing, the vacuum level, liquid recovery rates, and vapor recovery rates will be recorded during the extraction from the wells. TRC provides monitoring of organic compound concentrations of the extracted vapors using a PID; readings are recorded at approximately one-half hour intervals during the extraction. Water and SPH extracted by TRC will be placed into on-site temporary storage tanks for subsequent treatment and disposal. A temporary National Pollution Discharge Elimination System (NPDES) permit will be obtained to allow for the disposal of the treated water to the on-site stormwater system. It is anticipated that following Phase 1 pilot testing, the SPH thickness on top of the water surface on the temporary storage tank would be measured and then removed by skimming.

Water will be treated with activated carbon adsorption prior to discharge under the NPDES permit.

At the end of the Phase 1 pilot testing, the DTW and DTP will be measured in the wells MW-1, MW-2, MW-3, MW-9, MW-10, MW-11, MW-13, MW-16, P-3, P-5, and RW-1 through RW-5, following the termination of extraction, and daily for the next two days after the Phase 1 extraction. The water depth and product thickness will be measured in the temporary water storage tank(s) to provide an estimate of the total volume of water and SPH recovered during the Phase 1 pilot testing.

Phase 1- Pilot Testing Data Evaluation

Evaluation of the data collected during Phase 1 pilot testing will consist of the review of the estimates of the total volume of water and SPH recovered during the Phase 1 pilot testing, the vacuum rates applied to individual wells, and estimated vapor and liquid recovery rates for the individual wells. The total volume of SPH removed during Phase 1 pilot testing will also be reviewed to provide a general assessment of the effectiveness of vacuum extraction to provide bulk removal of SPH. The SPH monitoring results following the completion of the Phase 1 pilot testing will be used to provide a general assessment of the rate of SPH recovery into the wells used for extraction.

Phase 2- Pilot Testing Setup and Monitoring

Phase 2 of the proposed pilot testing is anticipated to be conducted over a period of two-days, and will also be completed by TRC. Phase 2 pilot testing is intended to further assess the effectiveness of SPH removal using vacuum extraction or bioslurping technology. Extraction during Phase 2 pilot testing will be limited to extraction from recovery wells RW-2 and RW-3 (Figure 2), allowing for monitoring of the nearby wells RW-1, RW-4, RW-5 and MW-10.

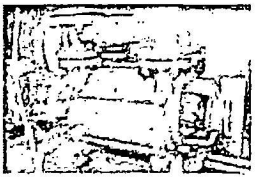
During the two days of Phase 2 pilot testing, two of the pressure transducers with data logging capabilities may be relocated for monitoring the nearby wells RW-1 and MW-10. Monitoring during Phase 2 pilot testing will also consist of monitoring changes in the DTW and DTP measurements during the extraction from RW-2 and RW-3. This monitoring data will be used to provide a general assessment of the potential influence on the SPH thickness in wells near the extractions wells, during extraction. Initial monitoring will consist of DTW and DTP measurements in RW-1 through RW-5, and MW-10. Additionally, the level of pressure or vacuum relative to atmosphere will also be measured prior to the start of vacuum extraction. Initial pressure/vacuum measurements will be made by Dwyer Magnahelic type gauge connected to the sealed wellhead.

Similar to Phase 1 pilot testing, a drop-tube will be initially installed at or above the groundwater – SPH interface, and the wellhead will be sealed around the drop-tube during the extraction. Extraction will be conducted at RW-2 and RW-3 for two periods of approximately seven hours (two days total). During the extraction, the vacuum level applied to the drop tube and the depth of the drop tube in the recovery well may be varied. Changing

the vacuum level applied to the drop tube and changing the depth of the drop tube in the well will be performed by TRC to assist in maximizing the recovery of the SPH and minimizing the recovery of water.

TRC utilizes a truck-mounted liquid pumping system that includes a catalytic oxidation system for the treatment of off-gas vapors. The vapor and liquid capacity of the liquid ring pump proposed for use are presented below. Additional information of the TRC's equipment and services are available at the following webpage link: (http://www.tremts.com/1st.htm)

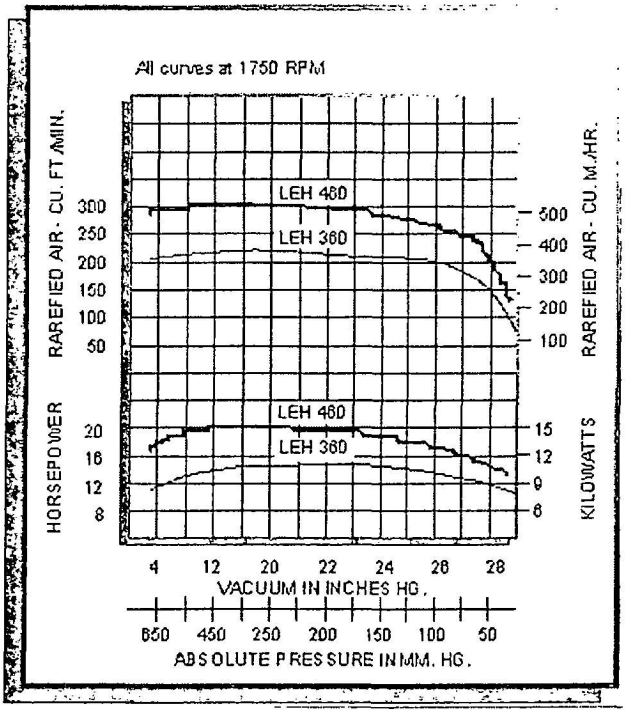
TRC ALTON GEOSCIENCE'S LIQUID RING PUMP LEH460 20 HP



SATURATED AIR PERFORMANCE DATA

Pump Model (inlet & outlet)	Vacuum in inches Hg.		6	12	18	22	24	28	28.9	Average Service Liquid Flow (USGPM) (1)
	Absolute pressure in inches Hg.		23.92	17.92	11.92	7.92	5.92	1.92	1.02	
	Absolute pressure in mm. Hg.		608	455	303	201	150	49	25	
	Speed (RPM)	Motor HP	ACFM	ACFM	ACFM	ACFM	ACFM	ACFM	ACFM	
LEH460 (3" x 3")	1750	20	298	305	313	309	306	266	217	10

TRC ALTON GEOSCIENCE'S LIQUID RING PUMP LEH460 20 HP Pump Curve



During the Phase 2 pilot testing, the vacuum level, liquid recovery rates, and vapor recovery rates will also be recorded during the extraction from the wells. The depth of the drop-tube in the RW-2 and the RW-3 wells will be recorded initially and as changes in the depths are made during the extraction. DTW and DTP will be measured in the wells RW-1, RW-4, RW-5 and MW-10 approximately every hour during Phase 2 pilot testing. These DTW and DTP measurements will be made in complement to the measurements from the pressure transducers with data logging capabilities. Following the termination of the extraction activities, and daily for the next two days after the Phase 2 extraction, DTW and DTP measurements will be made in wells RW-1 through RW-5 and MW-10. Water and SPH extracted by TRC will be placed into the on-site temporary storage tanks for subsequent treatment and disposal as discussed under Phase 1 pilot testing. The water depth and product thickness will be measured in the temporary water storage tank(s) to provide an estimate of the total volume of water and SPH recovered during the Phase 2 pilot testing.

In addition to monitoring of the DTW and DTP, during the Phase2 pilot testing, monitoring of the level of induced subsurface vacuum will be completed to estimate the potential radius of vacuum influence achieved during the Phase 2 pilot testing. Vacuum gauges will be attached to the nearby monitoring wells RW-1, RW-4, RW-5 and MW-10 to measure the induced subsurface vacuum. Connection and monitoring of the induced subsurface vacuum is anticipated to be conducted for periods of approximately fifteen minutes, twice daily during Phase 2 pilot testing.

Phase 2- Pilot Testing Data Evaluation

Evaluation of the data collected during Phase 2 pilot testing will consist of the review of the estimates of the total volume of water and SPH recovered during the Phase 2 pilot testing, the vacuum rates applied to individual wells, and estimated vapor and liquid recovery rates for the two wells. The volume of SPH and water recovered during the Phase 2 pilot testing will be compared to the measurements from the Phase 1 pilot testing to further assess the effectiveness of these approaches by comparing the volume of water removed to the volume of SPH. Similar to the Phase 1 pilot testing, the total volume of SPH removed during Phase 2 pilot testing will also be reviewed to provide a general assessment of the effectiveness of vacuum extraction to provide bulk removal of SPH. The DTW and DTP measurement from RW-1, RW-4, RW-5 and MW-10 will be reviewed to assess the effectiveness of vacuum extraction from RW-2 and RW-3 to influence product thicknesses in nearby wells. Additionally, changes in the levels of induced subsurface vacuum will be reviewed to estimate the potential radius of vacuum influence achieved during vacuum extraction from wells RW-2 and RW-3.

TASK 3 – REPORT PREPARATION

Upon completion of the fieldwork, KHM will prepare a report on the results of the delineation activities. This report will include figures showing the sampling locations, sample results, IRAM Area, and a cross-section of the stratigraphy encountered during drilling. In

addition the report will include tables presenting the laboratory analytical data, certified analytical reports, and a brief discussion of the results of the investigation activities.

SCHEDULE

KHM has tentatively scheduled the IRAM pilot test for the first week of February 2003. We would like to have DEQ's approval of this work plan prior to finalizing this schedule. The investigation of the IRAM area will be scheduled to follow the pilot test during February 2003. During March 2003 a report of the finding s will be prepared and submitted to DEQ for review.

KHM and Kinder Morgan look forward to working with you on this project. If you need further information or have any questions, please call the undersigned at (503) 639-8098.

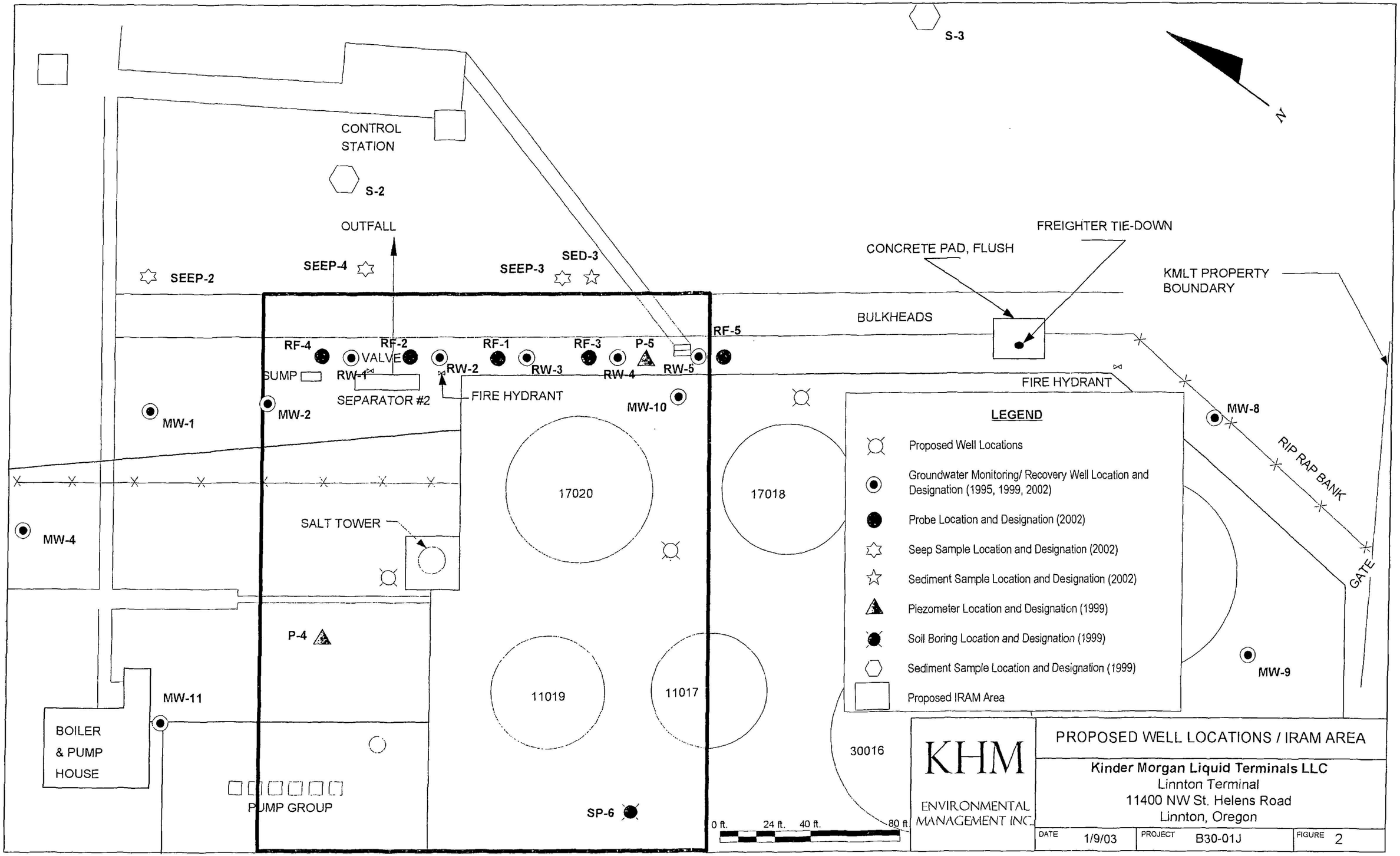
Sincerely,
KHM Environmental Management, Inc.

Kelly A. Kline, R.G.
Senior Project Geologist

R. Scott Miller, P.E.
Principal Engineer

Attachments: Figure 1 – Site Map
Figure 2 – Proposed Well Locations

cc: Mr. Eric Conard, Kinder Morgan Energy Partners, Orange, California
Mr. Steve Osborn, Kinder Morgan Energy Partners, Rocklin, California

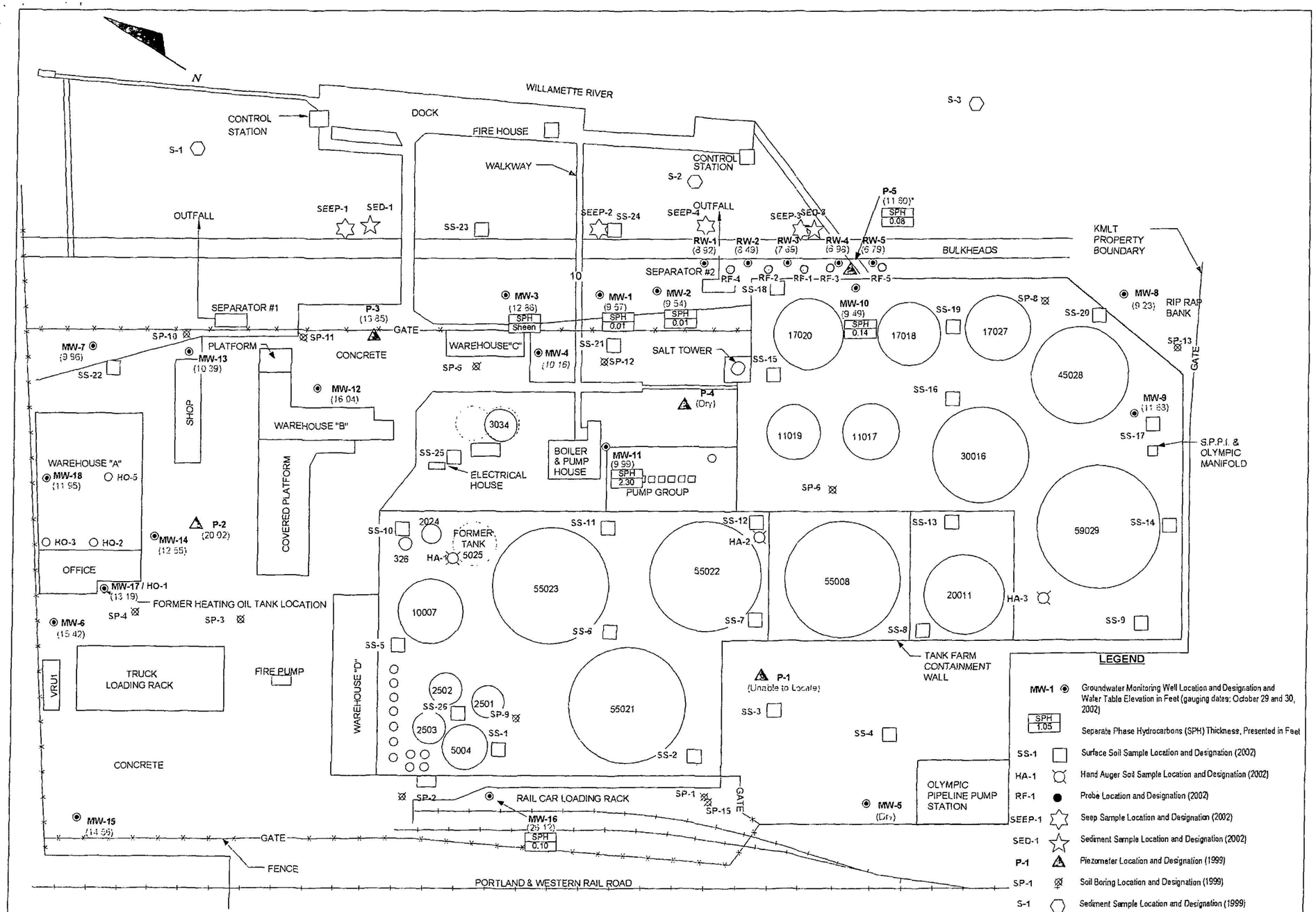


KHM ENVIRONMENTAL MANAGEMENT INC.

PROPOSED WELL LOCATIONS / IRAM AREA

Kinder Morgan Liquid Terminals LLC
Linnton Terminal
11400 NW St. Helens Road
Linnton, Oregon

DATE	PROJECT	FIGURE
1/9/03	B30-01J	2



KHM
ENVIRONMENTAL MANAGEMENT INC.

DESIGNED BY
DRAWN BY
CHECKED BY
APPROVED BY

SITE MAP

Kinder Morgan Liquid Terminals LLC
Linnton Terminal
11400 NW St. Helens Road
Portland, Oregon

DATE	PROJECT	DRAWING
11/19/02	B30-01J	1